

# Adaptive Deployable Entry and Placement Technology (ADEPT) Project

Game Changing Development Program | Space Technology Mission Directorate (STMD)



## ANTICIPATED BENEFITS

### To NASA funded missions:

ADEPT provides a mechanically deployable, low ballistic coefficient aeroshell system to enable missions not feasible with current SOA systems. ADEPT offers 10x reduction in peak heating and deceleration loads suitable for science missions to Venus, Mars and other destinations.

## DETAILED DESCRIPTION

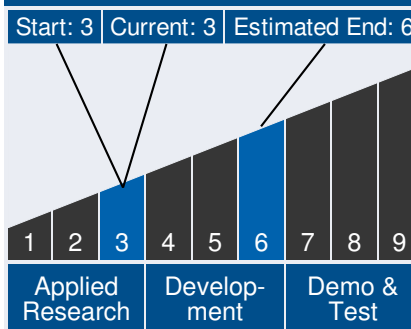
The ADEPT project is a new, advanced heat shield design to protect payloads and landers delivered to planetary bodies with atmospheres. ADEPT is a mechanically deployable heatshield, like an umbrella, that can open up at planet arrival to diameters 2-5 times greater than current rigid heatshields. This large size overcomes the current limitations of NASA's heatshields to enable delivery of 10s of metric tons to Mars' surface - essential for human exploration.



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## Technology Maturity



## Management Team

### Program Executive:

- Lanetra Tate

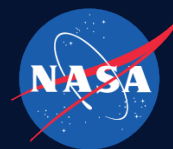
### Program Manager:

- Mary Wusk

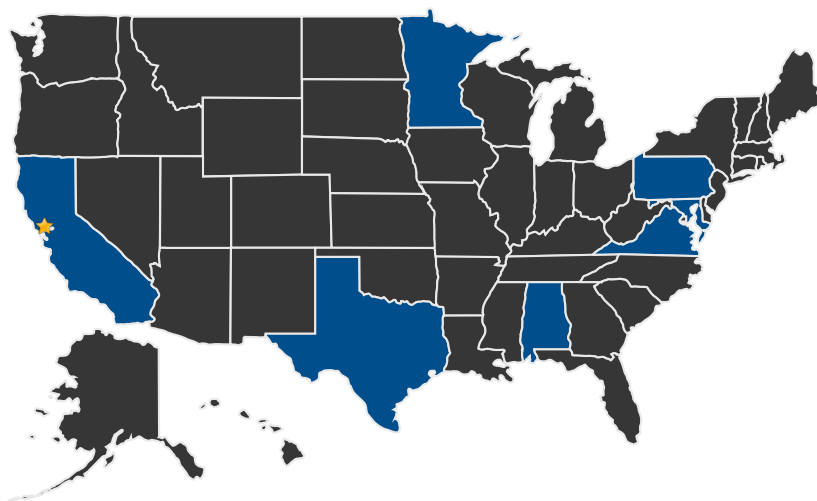
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## U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States  
With Work

★ **Lead Center:**  
Ames Research Center

### Other Organizations Performing Work:

- Bally Ribbon Mills
- Carbon-Carbon Advanced Technologies, Inc. (Kennedale, TX)
- CFD Research Corporation (Huntsville, AL)
- Southern Research Institute
- University of Minnesota (Minneapolis, MN)
- UP AEROSPACE INC

### Management Team (cont.)

#### Project Manager:

- Paul Wercinski

#### Principal Investigator:

- Michelle Munk

### Technology Areas

#### Primary Technology Area:

Entry, Descent, and Landing Systems (TA 9)

Entry, Descent, and Landing Systems (TA 9)

└ Aeroassist and Atmospheric Entry (TA 9.1)

└ Thermal Protection Systems for Deployable Decelerators (TA 9.1.2)

└ Flexible Thermostructural Thermal Protection System (TPS ) (TA 9.1.2.3)

#### Secondary Technology Area:

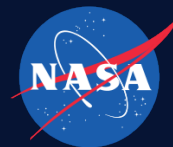
Entry, Descent, and Landing Systems (TA 9)

└ Descent and Targeting (TA 9.2)

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## Technology Areas (cont.)

### Additional Technology Areas:

Entry, Descent, and Landing Systems (TA 9)

- └ Descent and Targeting (TA 9.2)

- └ Attached Deployable Decelerators (TA 9.2.1)

- └ Mechanically Deployed Decelerators and Methods of Active Control (TA 9.2.1.2)

## DETAILS FOR TECHNOLOGY 1

### Technology Title

Adaptive Deployable Entry and Placement Technology (ADEPT)

### Technology Description

This technology is categorized as an architecture for unmanned spaceflight

The ADEPT concept consists of a 3D woven carbon fabric stretched over a mechanically deployable ribbed structure to form a low ballistic coefficient aeroshell entry system. The woven carbon fabric covers the majority of the deployed surface and is the primary drag-producing surface. Its flexibility also allows it to be stowable within the launch vehicle. The pure carbon fabric, with its high thermal conductivity, allows re-radiation from both the windward and leeward side of the fabric. The woven carbon cloth is integrated with structural ribs, similar to an umbrella, which is integrated with a mechanical actuation system to enable deployment prior to atmospheric entry.

The project's efforts will focus on two primary development areas: 1) The Carbon Fabric System area is focused on the development of the flexible carbon fabric, and will address key issues pertaining to its maturation for demanding hypersonic entry applications, and 2) The Structures and Mechanisms area concentrates on the design of the underlying ribs, struts, pivots, payload interface ring, and deployment system.

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## Capabilities Provided

ADEPT provides a low ballistic coefficient hypersonic decelerator system that significantly reduces peak heating and deceleration loads on the payload compared to traditional rigid aeroshell entry systems.

## Potential Applications

Planetary EDL missions including probes and landers to Mars and Venus, and Earth sample return where lower g-loads or increased mass to the surface are desired.